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A note on natural population levels of Phthirapteran species on sheep at district Rampur (U. P.), India

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Abstract: A look on the available literature indicated that population characteristics of Phthiraptera on Indian sheep deserved investigation. Two hundred sheep were sampled to reveal the population levels of phthirapteran species on sheep in the district Rampur (U.P.). Three phthirapteran species were recovered (*Bovicola ovis* Schrank, the face louse, *Linognathus ovillus* Neumann and the foot louse of sheep, *Linognathus pedalis* Osborn). The prevalence to Phthiraptera on sheep was 26.5%, (n= 200) during 2007. The difference in the prevalence of Phthiraptera on two sexes of sheep was not found significant at 5% level. Likewise, the difference in the prevalence of phthirapteran species on young, adult and older sheep was also insignificant at 5% level. The prevalence and intensity of infestation of Phthiraptera were found significantly correlated (at 5% level) to mean monthly temperature. The correlation between prevalence and relative humidity was not found significant at 5% level. The present report provides first information on the population characteristics of phthirapteran ectoparasites infesting Indian sheep.

Keywords: *Bovicola ovis,* Lice, *Linognathus ovillus, Linognathus pedalis*, Phthiraptera

INTRODUCTION

Ectoparasitic insects infesting sheep have been discussed by George *et al.* (1992), Yanan and Mohammed (2001) and Gabaj *et al.* (2008). Workers like Ward and Armstrong (1999), Bisdorff *et al.* (2006), Yacob *et al.*, (2008) and Changbunjong *et al.* (2009) have noted the prevalence of sheep lice in different parts of the world. Surprisingly, there is no report on the prevalence of Phthiraptera on Indian sheep. Distribution of ectoparasites on sheep has been further discussed by James and Moon (1999). The kind of skin injuries caused by sheep ectoparasites and the economic impact of parasitism have been indicated by several workers (Liebisch, 1988; James *et al.*, 1993; Rodostits *et al.*, 1994; Bayou, 1998; Ward & Armstrong, 2000; Chalachew, 2001; Kirst *et al.*, 2002; Kumsa *et al.*, 2012, Kufman *et al*., 2012, Amare *et al*., 2013 and Bedada *et al*., 2015). An scrutiny of literature revealed that studies on the population of Phthiraptera on Indian sheep has escaped the attention of workers. The present paper deals with population characteristics of three phthirapteran species infesting sheep in districts Rampur (India).

MATERIALS AND METHODS

AS many 200 sheep (20 young, 70 adults and 110 older) were surveyed during January to December, 2007 in five different localities of district Rampur. Sheep were examined by hair parting method given by Lewis *et al*. (1967) at 20 anatomical sites (measuring 1 square inch by placing the thick wire molded in square shape) with the help of magnifying lens fitted with light. Lice load from different sites of body were hand-picked and transferred to glass tubes containing 70% ethyl alcohol (using separate vial for each host). Each tube contained information regarding host sex, stage and locality. Later, lice were separated species wise, sex wise and stage wise under Stereo zoom trinocular microscope. Prevalence was calculated by dividing total number of infested hosts x 100 by the total number of examined hosts. Intensity of infestation was computed by dividing total numbers of lice recovered by total number of infested hosts. Likewise, sample mean abundance was calculated by dividing total number of lice recovered by total number of examined hosts. Significance of difference in prevalence was tested by using X^2. Degree of correlation between mean monthly prevalence and mean monthly value of two eco-factors (mean monthly temperature and mean monthly RH) by deriving the value of Karl Pearson's coefficient of correlation.

RESULTS AND DISCUSSION

The sheep biting louse, *Bovicola ovis* (Schrank), face louse, *Linognathus ovillus* (Neumann), and foot louse *Linognathus pedalis* (Osborn) were recorded from sheep in five localities (City proper, Swar, Tanda, Bilaspur and Milak) in the district Rampur during January to December, 2007 while observing the population

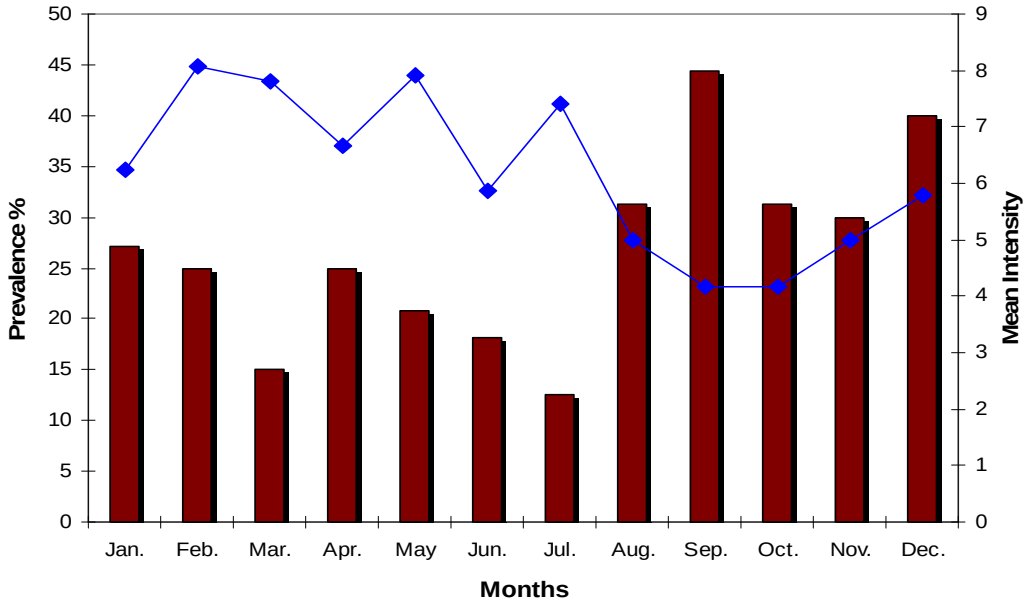

Fig. 1. *Showing the prevalence and intensity of infestation (based on mean of numbers counted on 20 sites per host) of phthirapteran on 200 sheep during different months of the year 2007, in the district Rampur (U.P.).*

characteristics of sheep lice. Eighty sheep were males and 120 females. Prevalence of Phthiraptera on male and female remained 28.7% and 25%, respectively (X^2 = 0.34, P < 0.05, insignificant). Furthermore, out of the 200 sheep examined, 20 were young, 70 adults and remaining 110 older ones. The prevalence of sheep lice on young adult and older sheep remained 30%, 22.8% and 28.18%, respectively. Statistical analysis analysis showed that differences in the prevalence rate in three groups were insignificant (X^2 = 0.811, P < 0.05).The overall prevalence of Phthiraptera on sheep was 26.5% (n = 200). Maximum percentage of infested sheep bore single species infestation (62.2%). Double species infestation was present upon 20.7% hosts while 16.9% sheep carried triple species infestation.

***Linognathus ovillus*:** During the present study face louse, *L.ovillus* was mostly found confined to face and the flecce which border the face. The prevalence of *L.ovillus* on sheep was 7.0% (n = 200). A total of 1327 lice (all the stages) were collected from the infested sheep (mean intensity 5.8 per square inch). The sample mean abundance was 0.40 per square inch (range, 65-138, n = 200) (based on 20 sites). For observing the population structure at different levels of infestation, entire data was divided into four categories. Two sheep carried 65-75 (mean of lice collected from all the 20 sites) lice (mean number, 66.0; 10.5M, 14.5F, 41.0N; M: F = 1:1.3; A: N = 1:1.6). Five sheep had 76-86 specimens of *L.ovillus* (mean number, 81.40; 10.8M, 16.8F, 53.8N; M: F = 1:1.5, A: N = 1:1.9). As many as, two sheep were found infested with 87-97 lice (mean number, 93.5; 10.5M, 15.5F, 67.5N; M: F = 1:1.4; A: N = 1:1.25). More than 97 lice were present upon five sheep (mean number, 120.2; 13.0M, 19.2F, 88.0N; M: F = 1:1.4; A: N = 1:1.3). In overall population composition, the mean number remained 94.8 (11.5M, 17.14F, 66.14N). The overall ratio of male and female, adult nymph and three nymphal instars were found to be 1:2, 1:2.3 and 1: 1.4: 1.6, respectively.

***Linognathus pedalis*:** Most of the population of *L.pedalis* was confined to hind legs and fore legs. Few lice occurred on back also. Prevalence of *L.pedalis* on sheep was 11.5% (n = 200). As many as, 1633 lice (all the stages) were collected from the infested sheep (mean intensity, 2.8 per square inch). The value of sample mean abundance was 0.33 per square inch. For observing the population structure at different levels of infestation, entire data was divided into four categories. Two sheep carried 43-53 (total number of lice counted from all the 20 sites) specimens of *L.pedalis* (mean number, 46.0; 7.0M, 10.5F, 28.5N; M: F = 1:1.5; A: N = 1:1.6). Four sheep carried 54-64 lice (mean number, 60.3; 9.3M, 13.0F, 38.0N; M: F = 1:1.4; A: N = 1:1.7). Maximum number of sheep (10) bore 65-75 specimens of *L.pedalis* (mean number, 68.6; 9.6M, 13.6F, 45.4N; M: F = 1:1.5; A: N = 1:1.9). Seven sheep were infested with more than 75 lice (mean number, 87.7; 9.2M, 16.4F, 62.0N; M: F = 1:1.7; A: N = 1:2.4). The data indicates mean number remained 71.0 (9.2M, 14.1F, 47.7N; M: F = 1:1.5; A: N = 1:1.2). The overall ratios of three nymphal instars were found to be 1: 1.3: 1.6.

***Bovicola ovis*:** In the present study *B.ovis* exhibited wide spread distribution on the body of sheep and was recovered from back, nape, abdomen and neck regions of the body of host . The prevalence of *B.ovis* on sheep was found 22.5%, (n = 45). As many as, 3226 lice (all the stage) were collected from the infested sheep

(mean intensity, 3.5 per square inch). The value of sample mean abundance remained 0.80 per square inch (based on 20 sites) (range, 15-131, n = 200). For the sake of description, entire data was divided into four classes. Six sheep carried 15-40 lice (mean number, 29.33; 4.16M, 6.5F, 18.66N; M: F = 1:1.5; A: N = 1:1.7). Maximum number of sheep (23) were infested with 41-80 specimens of *B.ovis* (mean number, 61.3, 8.3M, 13.1F, 39.7N; M:F = 1:1.5; A:N = 1:1.8). Thirteen sheep carried 81-120 lice (mean number, 96.9; 11.1M, 17.0F, 68.7N; M: F = 1:1.5; A: N = 1:2.4). Only three sheep had more than 120 lice (mean number, 127.0; 13.0M, 19.3F, 94.6N; M: F = 1:1.4; A: N = 1:2.9). In overall population composition, mean number remained 71.7 (8.9M, 13.7F, 49.0N; M: F = 1:1.5; A: N = 1:2.1). The overall ratio of three nymphal instars was 1: 1.2: 1.6.

Seasonal variation: During the present study, prevalence of Phthiraptera on sheep remained 27.2%, in January, became (25%) in February, decreased in March (15%), again rose in April (25%), exhibited gradual decline in three subsequent months (20.8%, 18.1% and 12.5%, respectively) (Fig. 1). It increased in August (31.2%), reached maximum (44.4%) in September, declined, in October (31.2%), remained nearly at same level in November (30%) and again increased in December (40%) (Fig. 1). Likewise, mean intensity of infestation was 6.2 (per square inch) in January, 8.1 in February, 7.8 in March, 6.7 in April and 7.9 in May. The intensity became slightly reduced in June (5.9). It increased in July (7.4) and remained low during four subsequent months (August 4.9, September 4.2, October 4.2 and November 4.9, respectively). It exhibited slightly increase in December (5.7).

The correlation between mean monthly prevalence and mean monthly temperature (r = 0.62) was found significant at 5 % level. Likewise, correlation between mean monthly lice index (mean numbers recorded per square inch at 20 anatomical sites) and the mean monthly temperature (r = -0.58) was also significant at 5 % level. The correlation between mean monthly prevalence and mean monthly relative humidity was not significant (r = 0.53) but the correlation between mean monthly intensity and relative humidity was found significant (r = 0.83) at 5 % level.

Survey of literature indicates that there is no report on the prevalence of Phthiraptera on domestic sheep of India. The prevalence and intensity of phthirapteran ectoparasites exhibits considerable variation in different parts of the world (Bisdorff *et al.,* 2006; Yacob *et al.* 2008; Changbunjong *et al.,* 2009; Kumsa *et al.,* 2012; Kufman *et al*., 2012; Amare *et al*., 2013; Bedada *et al*., 2015). During present study the overall prevalence of Phthiraptera on sheep was recorded as 26.5% in the district Rampur, during 2007. *B.ovis* was the most prevalent sheep lice, followed by sheep face louse *L.ovillus*. The sheep foot louse, *L.pedalis* remained the least prevalent species. Furthermore, there was no significant difference in the prevalence of lice on two sexes of sheep (at 5% level). Likewise, differences in the prevalence of Phthiraptera on younger, adult and older sheep also remained insignificant at 5% level. On the basis of grading system adopted during present study the mean intensity of three phthirapteran species remained 194.7 (based on 20 sites). Furthermore, the prevalence of Phthiraptera on sheep varied from 12.5%-44.4%, from January to December in the year 2007. The prevalence was above, 25% from August to February. It remained below 21% in remaining months (March to July, except April). However, the mean intensity of infestation appeared to be higher during winter months in contrast summer months. Mammalian lice are known to exhibit maxima during winter months. As far as, population composition is concerned, as per expectation, females outnumbered the males in natural population and nymphal population dominated over adults in case of all three species. Present report furnishes first information on the population levels of phthirapteran ectoparasites on sheep of an Indian locality.

Conclusion

Present report furnishes first information on the population levels of three phthirapteran species on two hundred Indian sheep. The prevalence of Phthiraptera was 26.5%. The mean intensity of infestation was 194.7 (based on 20 sites measuring one square inch). Host sex or stage related differences in the prevalence and intensity of phthirapterans were not significant at 5% level. The prevalence intensity of infestation was found significantly correlated to mean monthly temperature.

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